April 23, 1940. G. M. GULLICK 2,198,163

METHOD OF AND APPARATUS FOR MINING, QUARRYING, AND THE LIKE

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Fig. 1.

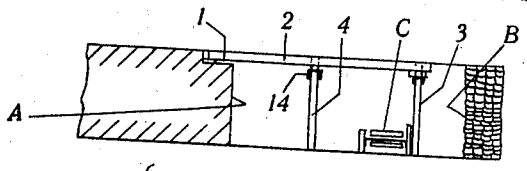


Fig. 2.

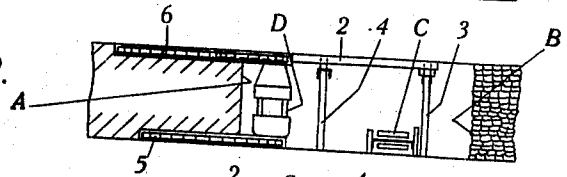


Fig. 3.

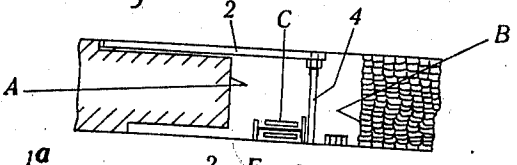


Fig. 4.

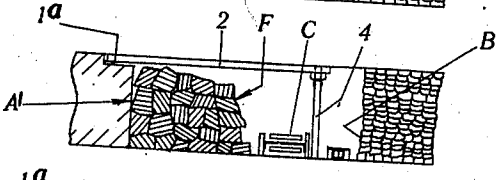


Fig. 5.

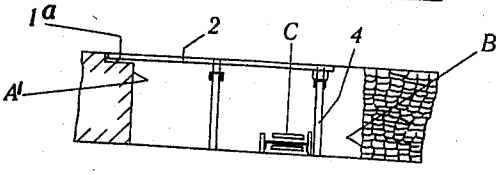
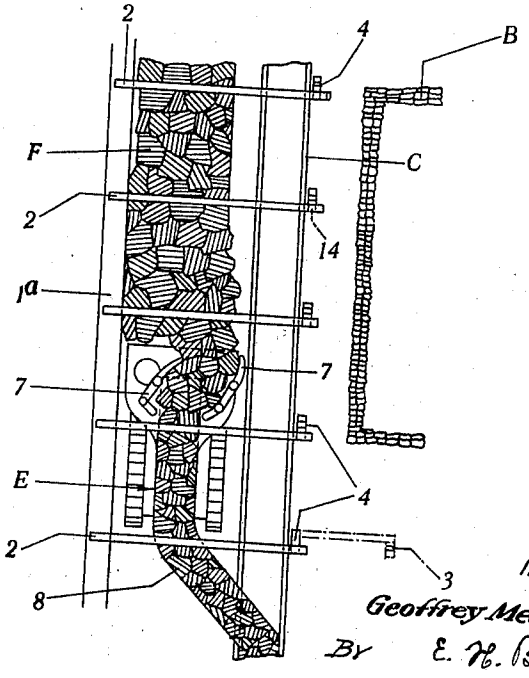


Fig. 6.



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Fig. 7

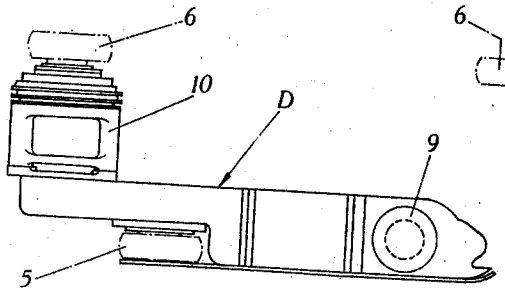


Fig. 8.

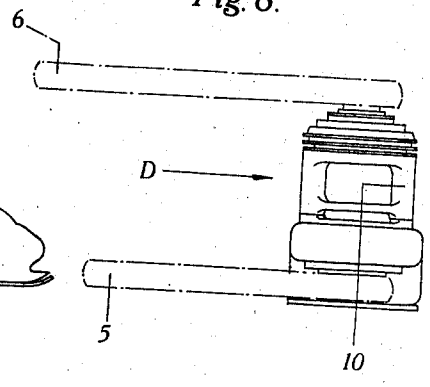


Fig. 9.

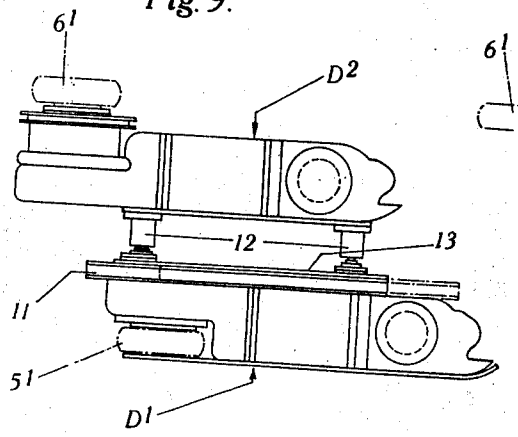


Fig. 10.

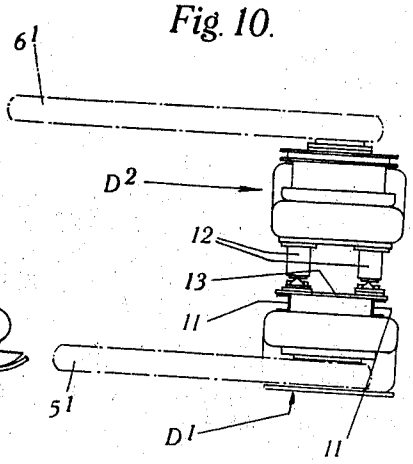
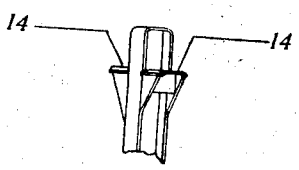


Fig. 11.



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UNITED STATES PATENT OFFICE

2,198,163

METHOD OF AND APPARATUS FOR MINING, QUARRYING, AND THE LIKE

Geoffrey Merton Gullick, Glasgow, Scotland, assignor to Mavor and Coulson, Limited, Glasgow, Scotland

Application June 1, 1938, Serial No. 211,299
In Great Britain June 12, 1937

6 Claims. (Cl. 262—1)

A method, known as fore-timbering or fore-poling, sometimes used in coal mining for supporting the roof at the coal face comprises drilling holes in the face at the roof level to a greater depth than the depth to which the coal is about to be removed, inserting one end of a roof beam into the hole and supporting the beam at its outer end by means of a prop, the beams being upheld, during and after breaking down of the coal, by their engagement with the inner extremities of the holes. This method of working is, however, limited in its application because of its expense.

The present invention refers to a method of mining, quarrying and the like which provides in an improved manner for fore-poling and which enables drilling of the face, hereinafter assumed to be a coal face, and shot firing to be eliminated, allows the breaking down of the coal to be controlled and provides for its being readily handled mechanically at the position where it is broken down.

According to this invention, two cuts are made in the coal face, an undercut at or near the floor level and a roof cut at or near the roof level, the roof cut being made of a greater depth inwards from the face than the undercut, roof beams are then inserted into the roof cut so that their inner ends reach beyond the depth of the undercut, the roof beams are supported in front of the coal face by props or the like, and the coal between the undercut and the roof cut is broken off, the extra depth of the roof cut leaving a shelf or ledge on which the inner ends of the roof beams rest while, and after, the coal is broken, thus securing the roof.

If the coal is such that, after cutting, it does not break off of itself, breaking may be effected by the application of downward pressure to it within the roof cut, for example, by hydraulic pressure, or breaking may be effected by the application of upward pressure within the undercut. In this way, coal can be mined without drilling and without shot firing, and the breaking is under control in that the coal is not scattered as it would be, for example, as a result of shot firing.

A face conveyor may be assembled on the face side of the row of props supporting the outer ends of the roof beams and a mechanical loader be operated between the conveyor and the new coal face to load the broken coal on to the face conveyor.

It is preferred that the undercut and the deeper roof cut should be made simultaneously, but they may be made separately, in which latter case the undercut should as a rule be made first.

For simultaneously making an undercut and a roof cut, there is provided in accordance with this invention a cutting machine having two cutter members, for example, cutter chains, adapted to operate simultaneously one above the other at a substantial distance apart vertically and the upper of which when in the normal cutting position has a greater cutting reach than the lower. It is desirable that in a machine of this nature the arrangement should be such that the lower cutting member cuts in advance of the upper cutter member, as better breakage of the coal from the coal face results. This feature of one cutter member cutting in advance of another is known in itself, its embodiment in a machine having equal undercutting and overcutting members being disclosed in the specification of United States Patent No. 1,979,694, granted to W. A. Logan.

In this connection, in accordance with a further feature of the present invention, a machine may be so constructed that the lead (or degree of advance) of the lower cutter member relative to the upper cutter member can be adjusted from a zero position (i. e. where there is no lead) to a maximum amount allowed for in the construction of the machine.

The invention will now be described with reference to the accompanying drawings, in which:

Figures 1, 2, 3, 4, 5 and 6 illustrate diagrammatically successive stages in the method of mining,

Figure 7 is a side elevation and Figure 8 is an end elevation showing a first example of coal cutting machine for use in the method in accordance with the invention,

Figure 9 is a side elevation and Figure 10 is an end elevation showing a second example of coal-cutting machine, and

Figure 11 shows a detail.

The diagrams are vertical sections at right angles to the coal face and show coal face A, packing B, a face conveyor C, and a coal cutting machine D.

As has already been explained, this invention provides for the formation of a shelf or ledge in the coal face at or near the roof level to carry the inner ends of roof beams while and after the coal below is broken. In Figure 1, it is assumed that a mass of coal has just been removed in accordance with the invention, leaving a ledge 1 in the new face A supporting the inner ends of roof beams 2, the outer ends of which are sup-

ported by a row of props 3, each of which has a laterally projecting bracket for that purpose. A fresh row of props is now set up at 4 with their brackets under and just clear of the roof beams 2. The coal cutting machine D, having an undercutting jib 5 and an overcutting jib 6, the latter of greater cutting reach than the former, now cuts along the face, see Figure 2, forming an undercut and a roof cut of greater depth than the undercut, say 4 feet 6 inches deep in the one case and 5 feet 9 inches deep in the second case. Each roof beam 2 is removed as the machine D approaches and when the machine is past is re-set with its outer end supported on the prop 4 and its inner end reaching to the extremity of the roof cut, see Figure 3. The props 3 can now be removed, the conveyor C is advanced to the face side of the row of props 3 and the packing B is also advanced.

The coal which has been overcut and undercut tends to break down on to the vertical plane extending upwards from the inner extremity of the undercut, see Figure 4, in many cases coming down of its own accord, but if necessary being brought down by the use in either of the cuts of a hydraulic coal burster, similar to apparatus at present used for breaking down undercut coal by insertion into a hole drilled in the coal face above the cut. The inner end of the roof beam 2 is left supported on a ledge 1^a corresponding with the ledge 1 initially assumed to exist in Figure 1.

The position is now as shown in Figures 4 and 6. A mechanical loader E, shown as being of the known type with oscillating gathering arms 7 and a rearwardly and laterally extending cantilever conveyor part 8 is now advanced into the broken coal F, see Figure 6, and loads it into the face conveyor C, leaving the new face A^1 clear, as shown in Figure 5 in which the conditions are virtually a repetition of the conditions shown in Figure 1. The process can then be repeated.

Figures 7 and 8 show a coal cutting machine D having two superimposed cutter-chain jibs 5 and 6, one for undercutting and the other for roof cutting. The undercutting jib 5 is arranged to cut in advance of the overcutting jib 6 while the overcutting jib 6 has a greater cutting reach than the undercutting jib 5. Both cutter-chains are driven from one and the same motor in the body of the machine and the machine is adapted to be advanced by haulage means, the drum 9 of which is shown. The overcutting jib 6 is carried by a turret structure 10 which permits of adjustment of its height.

Figures 9 and 10 show a machine having provision whereby the lead of the lower cutter-member relative to the upper cutter member can be adjusted from a zero position to a maximum amount allowed for in the construction of the machine. This machine is made up of a first machine element D^1, which comprises a body complete with motor, cutter member 5^1 for undercutting, and haulage means, and a second machine element D^2 mounted upon the first element D^1 and comprising a separate body complete with motor, cutter member 6^1 for overcutting, and haulage means. The lower element D^1 has two parallel longitudinal bars 11 upon it, one at or near each side, see Figure 10. The upper element D^2 is carried by means of four screw jacks 12 the feet of which engage with a plate 13 resting upon the longitudinal bars 11, and the upper element D^2 with the jacks 12, plate 13 and bars 11 can be slid longitudinally upon the lower element D^1, provision being made for holding them at any desired position of adjustment, for example, by means of screw clamps (not shown). In some cases there may be screw mechanism for effecting the longitudinal movement, which will serve to hold the upper element at the longitudinal position desired. By equal operation of the jacks, the height of the overcutting member relative to the base of the machine can be varied and by operating the jacks differentially the upper element can be inclined relative to the lower element, the connection of the jacks, top and bottom, being arranged to allow of such movement. Provision may be made for effecting any or all of the adjustments by power from one or other of the motors of the machine, or by hand.

Figure 11 shows the top of a steel mine post of H-section with two welded-on brackets 14, one at each side, for the support of roof beams.

A machine for simultaneous undercutting and roof cutting, may be of the cutter-chain type, the cutter-bar type, or of disc type, or a combination of any two of these types.

I claim:

1. The method of mining comprising making two cuts in the coal face, an undercut at or near the floor level and a roof cut at or near the roof level, the roof cut being made of a greater depth inwards from the face than the undercut, inserting roof beams into the roof cut so that their inner ends reach beyond the depth of the undercut, supporting the roof beams in front of the coal face by props or the like, and breaking off the coal between the undercut and the roof cut, the extra depth of the roof cut leaving a ledge on which the inner ends of the roof beams rest while and after the coal is broken, thus securing the roof.

2. The method of mining comprising making two cuts in the coal face, an undercut at or near the floor level and a roof cut at or near the roof level, the roof cut being made of a greater depth inwards from the face than the undercut, inserting roof beams into the roof cut so that their inner ends reach beyond the depth of the undercut, supporting the roof beams in front of the coal face by props or the like, breaking off the coal between the undercut and the roof cut, the extra depth of the roof cut leaving a ledge on which the inner ends of the roof beams rest while and after the coal is broken, thus securing the roof, assembling a face conveyor on the face side of the row of props supporting the outer ends of the roof beams, and operating a mechanical loader between the conveyor and the new coal face, to load the broken coal on to the face conveyor.

3. The method of mining comprising making two cuts simultaneously in the coal face, an undercut at or near the floor level and a roof cut at or near the roof level, the roof cut being made of a greater depth inwards from the face than the undercut, inserting roof beams into the roof cut so that their inner ends reach beyond the depth of the undercut, supporting the roof beams in front of the coal face by props or the like, and breaking off the coal between the undercut and the roof cut, the extra depth of the roof cut leaving a ledge on which the inner ends of the roof beams rest while and after the coal is broken, thus securing the roof.

4. The method of mining comprising making two cuts simultaneously in the coal face, an undercut at or near the floor level and a roof cut at or near the roof level, the roof cut being made of a greater depth inwards from the face than

the undercut, inserting roof beams into the roof cut so that their inner ends reach beyond the depth of the undercut, supporting the roof beams in front of the coal face by props or the like, breaking off the coal between the undercut and the roof cut, the extra depth of the roof cut leaving a ledge on which the inner ends of the roof beams rest while and after the coal is broken, thus securing the roof, assembling a face conveyor on the face side of the row of props supporting the outer ends of the roof beams, and operating a mechanical loader between the conveyor and the new coal face, to load the broken coal on to the face conveyor.

5. A coal cutting machine having a machine body adapted for movement along a coal face, two cutter members projecting from said body, one above the other, to make an undercut and a roof cut in the face simultaneously, motor means for driving the said cutter members, the upper of the two cutter members when in the normal cutting position having a greater cutting reach than the lower to make the roof cut of a greater depth inwards from the face than the undercut, and the two cutter members being relatively movable longitudinally for adjusting the lower cutter member to cut in advance of the upper cutter member to a degree variable from a maximum allowed for in the construction of the machine to zero, with means for securing the cutter members in position as adjusted.

6. A coal cutting machine having a machine body to be moved along a coal face, two cutter members projecting from said body, one above the other, to make an undercut and a roof cut in the face simultaneously, haulage means for moving the machine along the coal face, motor means for driving the said haulage means and the said cutter members, the upper of the two cutter members when in the normal cutting position having a greater cutting reach than the lower to make the roof cut of a greater depth inwards from the face than the undercut, and the two cutter members being relatively movable longitudinally for adjusting the lower cutter member to cut in advance of the upper cutter member to a degree variable from a maximum allowed for in the construction of the machine to zero, with means for securing the cutter members in position as adjusted.

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